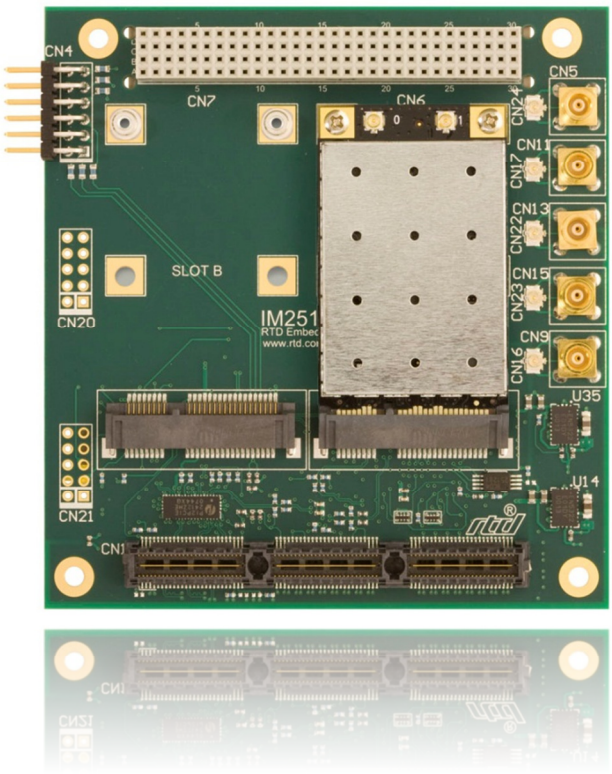
WLAN25202ERS

Mini-PCI Express Card Carrier Module with WLAN Module

User's Manual

BDM-610020089Rev. A



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Revision History

Rev A	Initial Release

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1 Introduction

1.1 Product Overview

The WLAN25202 is a Mini PCI Express carrier board with one of the slots pre-populated with a wireless Ethernet adapter. The wireless adapter used on this board is the Atheros AR9280 Wireless Mini PCI-Express card. The WLAN25202 carrier board has one free Mini PCI-Express card slot for use by the customer. The card slot supports x1 PCI Express and USB mini cards to enable the user more flexibility. It also provides a full single x1 PCI Express and USB link repopulation. It is compatible with all PCI Express cpuModules.

1.2 Board Features

- PCI Express Universal Connector with the ability to stack above or below the cpu
- PCI Connector is used as a pass through connector only
- Power rails (+5V, +3.3V, +12V) connected on the PCIe bus
- Full Single x1 PCI Express and USB Lane repopulation
- PCI Express Bus:
    - Provides 2.5 Gbps in each direction
    - Single lane and single Virtual Channel operation
        - Compatible with multi-Virtual Channel chipsets
    - Packetized serial traffic with PCI Express Split Completion protocol
    - Data Link Layer Cyclic Redundancy Check (CRC) generator and checker
    - Automatic Retry of bad packets
    - In-band interrupts and messages
    - Message Signaled Interrupt (MSI) support
- 1 Dual-Use Mini PCI Express Card Sockets
    - Full card stand-offs will be installed standard
    - Will include stand-offs for the half card in packaging
        - *NOTICE* When using a full card, the half card stand-offs cannot be installed. There is a possibility that the half card stand-offs could short to a component on the bottom of the full card.
    - 5 external antennae connectors for use with Wifi/GPS/GSM cards
    - External connector for LEDs
    - SIM card connector populated for each Mini PCI Express card slot:
        - SLOT A: Has a 2x5 0.1" DIL connector for SIM card expansion
        - SLOT B: Can have ether an SIM Card Socket or a 2x5 0.1" DIL connector
- Atheros AR9280 WLAN Mini PCI-Express Card
    - Compliant to IEEE Standards: 802.11a/b/g/n
    - Support for 2x2 MIMO with spatial multiplexing and MRC
    - Features 1x1 Dynamic MIMO Power Save to reduce power usage
    - Enables up to 300 Mbps PHY rate
    - Driver support for XP/Vista/7 and Linux operating systems
    - Compliant with PCI-Express Mini Card 1.1 Standard
    - Operating Temp range: -20 to +70 C

1.3 Ordering Information

The WLAN25202ERS is available with the following options:

Table 1: Ordering Options

Part Number	Description
WLAN25202ERS	Mini PCI-E Card add-on board w/ Atheros WLAN module installed
IDAN-WLAN25202ERS	Mini PCI-E Card add-on board in IDAN enclosure w/ Atheros module installed

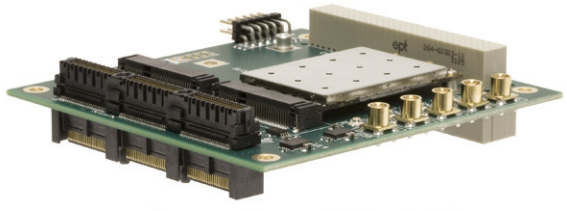

Figure 1: WLAN25202ERS

The Intelligent Data Acquisition Node (IDAN™) building block can be used in just about any combination with other IDAN building blocks to create a simple but rugged 104™ stack. This module can also be incorporated in a custom-built RTD HiDAN™ or HiDANplus High Reliability Intelligent Data Acquisition Node. Contact RTD sales for more information on our high reliability systems.

1.4 Contact Information

1.4.1 Sales Support

For sales inquiries, you can contact RTD Embedded Technologies sales via the following methods:

Phone: 1-814-234-8087 Monday through Friday, 8:00am to 5:00pm (EST).
E-Mail: sales@rtd.com

1.4.2 Technical Support

If you are having problems with you system, please try the steps in the Troubleshooting section of this manual.

For help with this product, or any other product made by RTD, you can contact RTD Embedded Technologies technical support via the following methods:

Phone: 1-814-234-8087 Monday through Friday, 8:00am to 5:00pm (EST).
E-Mail: techsupport@rtd.com

2 Specifications

2.1 Board Operating Conditions

Table 2: Operating Conditions

Symbol	Parameter	Test Condition	Min	Max	Unit
V_{cc5}	5V Supply Voltage		4.75	5.25	V
V_{cc3}	3.3V Supply Voltage		n/a	n/a	V
V_{cc12}	12V Supply Voltage		n/a	n/a	V
V_{cc-12}	-12V Supply Voltage		n/a	n/a	V
T_a	Operating Temperature		-40	+85	C
T_s	Storage Temperature		-55	+125	C
RH	Relative Humidity	Non-Condensing	0	90%	%
MTBF	Mean Time Before Failure	23C	TBD		Hours

2.2 Board Electrical Characteristics

Table 3: Electrical Characteristics

Symbol	Parameter	Test Condition	Min	Max	Unit
P	Power Consumption	V_{cc5} = 5.0V		0.5	W
I_{cc5}	5V Input Supply Current	Active		100	mA
V_{OUT12}	-12V Output Supply Voltage	JP1 = 1-2 (ON)	-13.2	-10.8	V
I_{OUT12}	-12V Output Supply Current	JP1 = 1-2 (ON)		500	mA
I_{BUS5}	5V Current between buses			8.0	A
$I_{BUS3.3}$	3.3V Current between buses			3.0	A
I_{BUS12}	12V Current between buses			1.0	A
PCIe Bus					
	Differential Output Voltage		0.8	1.2	V
	DC Differential TX Impedance		95.2	116.9	Ω
	Differential Input Voltage		0.175	3.3	V
	DC Differential RX Impedance		92.7	115.8	Ω
	Electrical Idle Detect Threshold		61	173	mV

2.3 PCI Express Mini Card Operating Conditions

Each Mini PCI Express Card has its own individual operating conditions and those conditions vary from card to card. Installing cards into this board can affect the overall operating temperature of the system. Make sure to check the operating conditions of the Mini PCI Express cards before placing these systems in extreme conditions.

3 Board Connection

3.1 Board Handling Precautions

To prevent damage due to Electrostatic Discharge (ESD), keep your board in its antistatic bag until you are ready to install it into your system. When removing it from the bag, hold the board at the edges, and do not touch the components or connectors. Handle the board in an antistatic environment, and use a grounded workbench for testing and handling of your hardware.

3.2 Physical Characteristics

- Weight: Approximately 55 g (0.12 lbs.)
- Dimensions: 90.17 mm L x 95.89 mm W (3.550 in L x 3.775 in W)

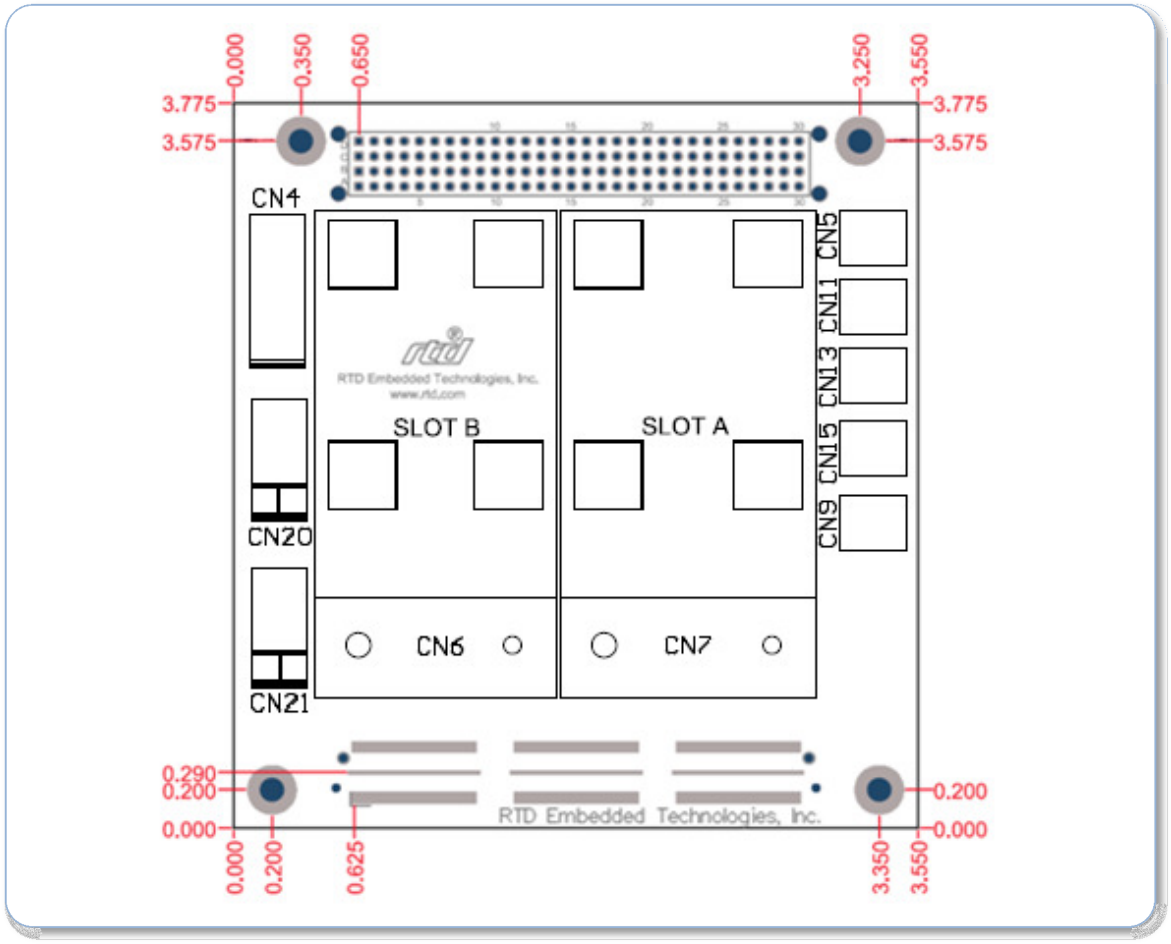

Figure 2: Board Dimensions

3.3 Connectors and Jumpers

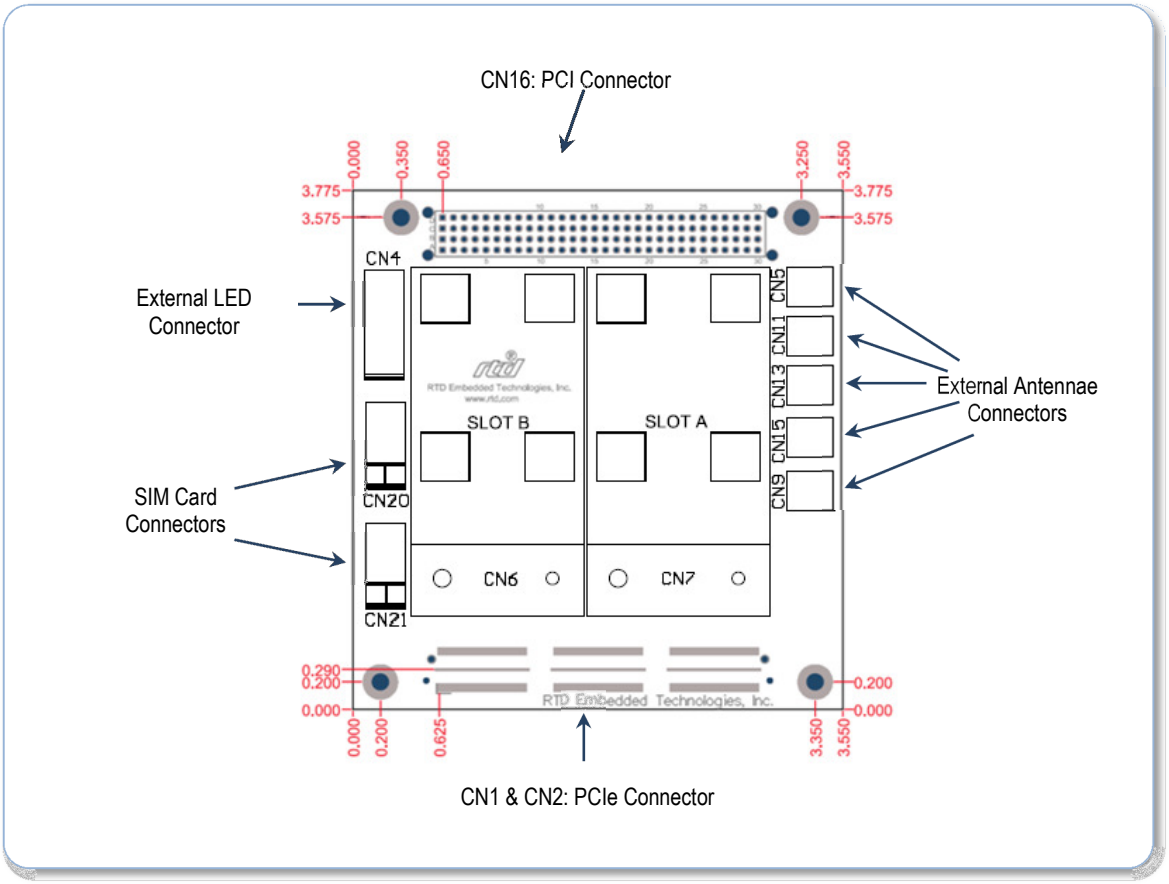

Figure 1: Board Connections

3.3.1 External I/O Connectors

The WLAN25202 has several external I/O connectors that allow the user to bring out functions to external

- CN5/9/11/13/15: External Antennae connectors to allow the user to connect external connectors to the system to allow better operation of GSM/GPS/Wifi cards.
- CN4: Connector to bring out the LEDs from the Mini PCI Express cards.
- CN6/7: Dual Use Mini PCI Express Card sockets. Boards come with the full card stand-offs installed standard. The boards will be shipped with the half card stand-offs to be installed by the user. "Slot A" refers to CN6 while "Slot B" refers to CN7.
- CN20: UIM signal connection for Mini PCI Express card slot CN6.
- CN21/U5: Has option of either having the SIM card socket installed or a 2x5 0.1" DIL connector. The SIM card socket takes the standard SIM card. The board standard is having the SIM card socket installed and the 2x5 0.1" DIL connector not populated for the SIM connection for card slot CN7.

3.3.2 BUS CONNECTORS

CN1(Top) & CN2(Bottom): PCIe Connector

The PCIe connector is the connection to the system CPU. The position and pin assignments are compliant with the *PCI/104-Express Specification*. (See PC/104 Specifications on page 19)

The WLAN25202 is a "Universal" board, and can connect to either a Type 1 or Type 2 PCIe/104 connector.

CN3: PCI Connector

The PCI connector is the connection to PCI peripheral modules. This connector is used on this board as a pass through connector only.

3.4 Steps for Installing

1. Always work at an ESD protected workstation, and wear a grounded wrist-strap.
2. Turn off power to the PC/104 system or stack.
3. Select and install stand-offs to properly position the module on the stack.
4. Remove the module from its anti-static bag.
5. Check that pins of the bus connector are properly positioned.
6. Check the stacking order; make sure all of the busses used by the peripheral cards are connected to the cpuModule.
7. Hold the module by its edges and orient it so the bus connector pins line up with the matching connector on the stack.
8. Gently and evenly press the module onto the PC/104 stack.
9. If any boards are to be stacked above this module, install them.
10. Attach any necessary cables to the PC/104 stack.
11. Re-connect the power cord and apply power to the stack.
12. Boot the system and verify that all of the hardware is working properly.

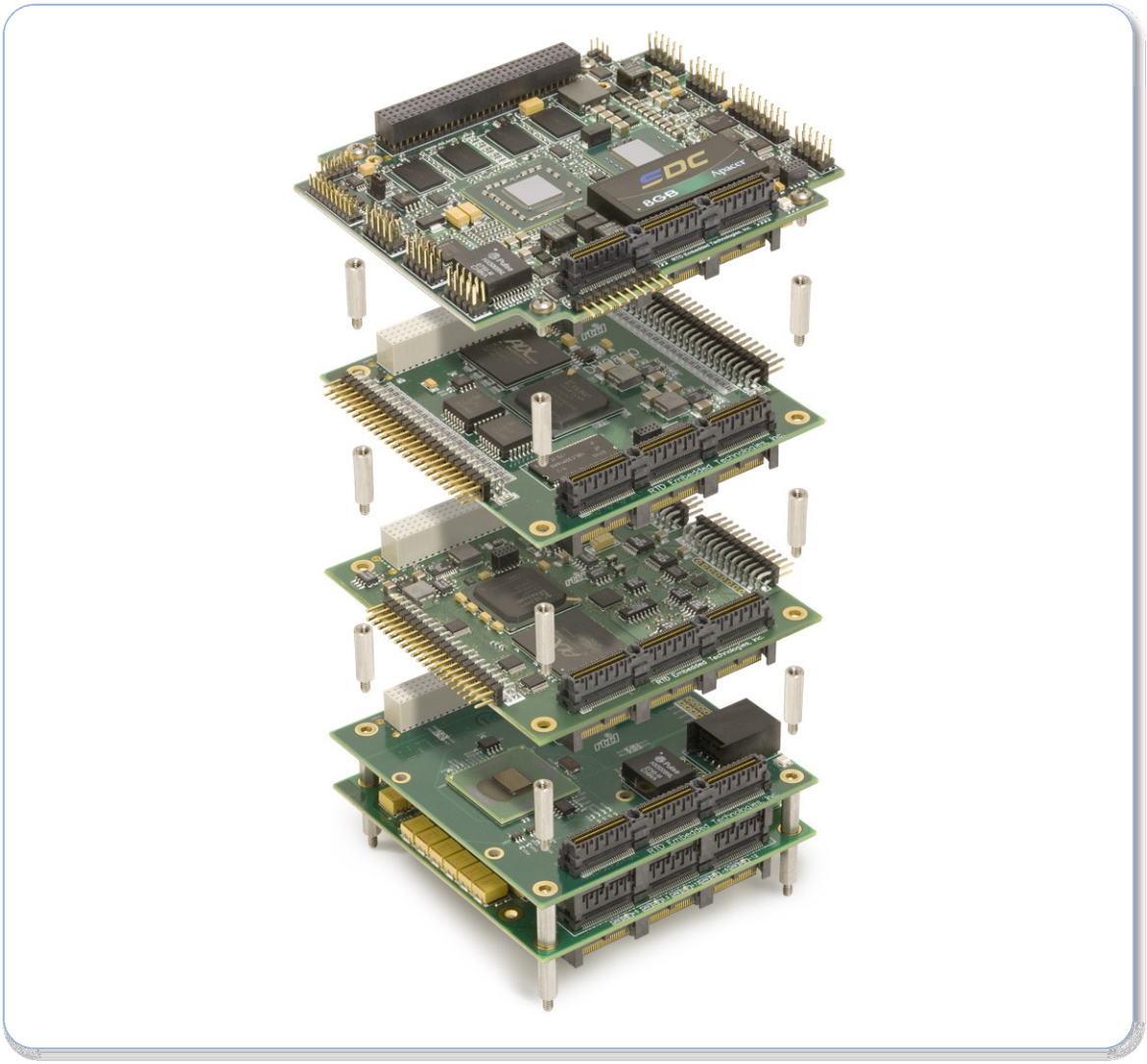

Figure 2: Example 104™ Stack

4 IDAN Connections

4.1 Module Handling Precautions

To prevent damage due to Electrostatic Discharge (ESD), keep your module in its antistatic bag until you are ready to install it into your system. When removing it from the bag, hold the module by the aluminum enclosure, and do not touch the components or connectors. Handle the module in an antistatic environment, and use a grounded workbench for testing and handling of your hardware.

4.2 Physical Characteristics

- Weight: Approximately 0.21 Kg (0.46 lbs.)
- Dimensions: 151.972 mm L x 129.978 mm W x 16.993 mm H (5.983 in L x 5.117 in W x 0.669 in H)

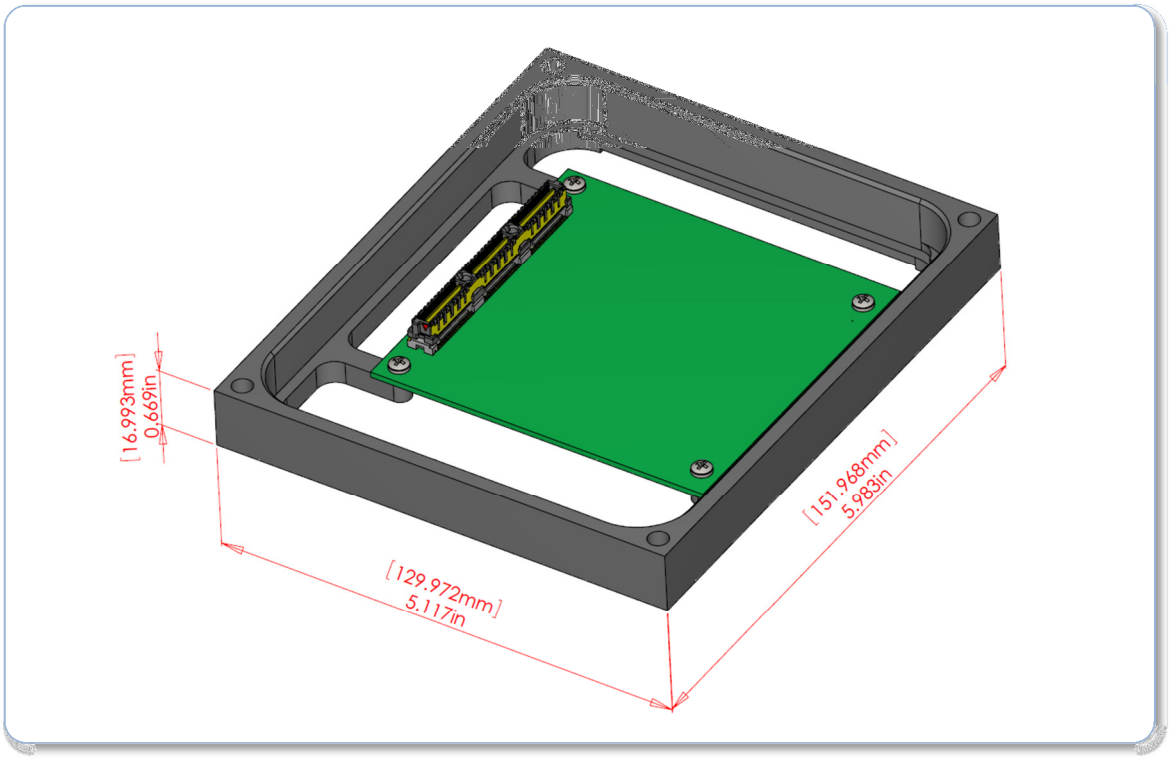

Figure 3: IDAN Dimensions

4.3 Connectors

4.3.1 External I/O Connectors

4.3.1.1 Antennae Connectors

These allow the user to connector external antennae to the system for use with the installed mini cards to improve wireless signal transmission between the mini cards and the external environment.

4.3.1.2 External LED Connectors

This allows a mini card with LED signals to be able to bring them out either to LEDs in the frame or to an external LED input.

4.3.2 Bus Connectors

CN1(Top) & CN2(Bottom): PCIe Connector

The PCIe connector is the connection to the system CPU. The position and pin assignments are compliant with the *PCI/104-Express Specification*. (See PC/104 Specifications on page 19)

The WLAN25202 is a "Universal" board, and can connect to either a Type 1 or Type 2 PCIe/104 connector.

CN3: PCI Connector

The PCI connector is the connection to PCI peripheral modules. The position and pin assignments are compliant with the *PCI/104-Express Specification*. (See PC/104 Specifications on page 19)

4.4 Steps for Installing

1. Always work at an ESD protected workstation, and wear a grounded wrist-strap.
2. Turn off power to the IDAN system.
3. Remove the module from its anti-static bag.
4. Check that pins of the bus connector are properly positioned.
5. Check the stacking order; make sure all of the busses used by the peripheral cards are connected to the cpuModule.
6. Hold the module by its edges and orient it so the bus connector pins line up with the matching connector on the stack.
7. Gently and evenly press the module onto the IDAN system.
8. If any boards are to be stacked above this module, install them.
9. Finish assembling the IDAN stack by installing screws of an appropriate length.
10. Attach any necessary cables to the IDAN system.
11. Re-connect the power cord and apply power to the stack.
12. Boot the system and verify that all of the hardware is working properly.

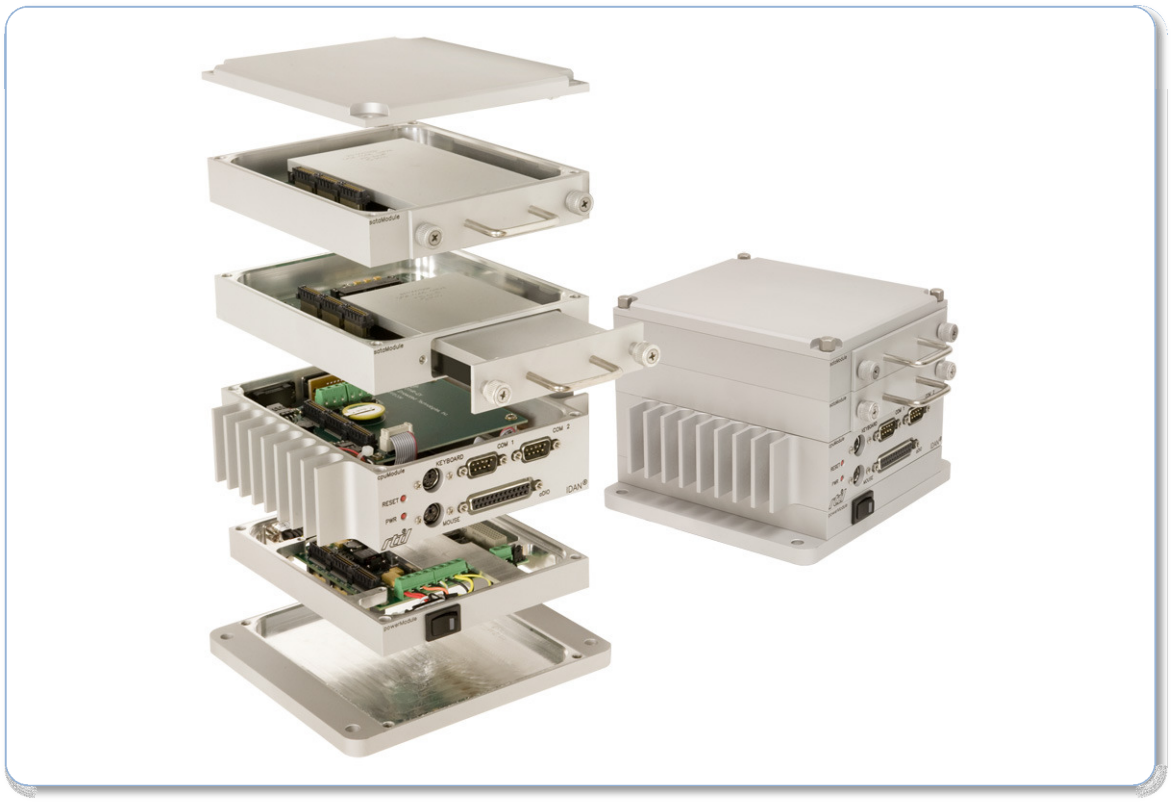

Figure 4: Example IDAN System

5 Functional Description

5.1 Block Diagram

The Figure below shows the functional block diagram of the WLAN25202. The various parts of the block diagram are discussed in the following sections.

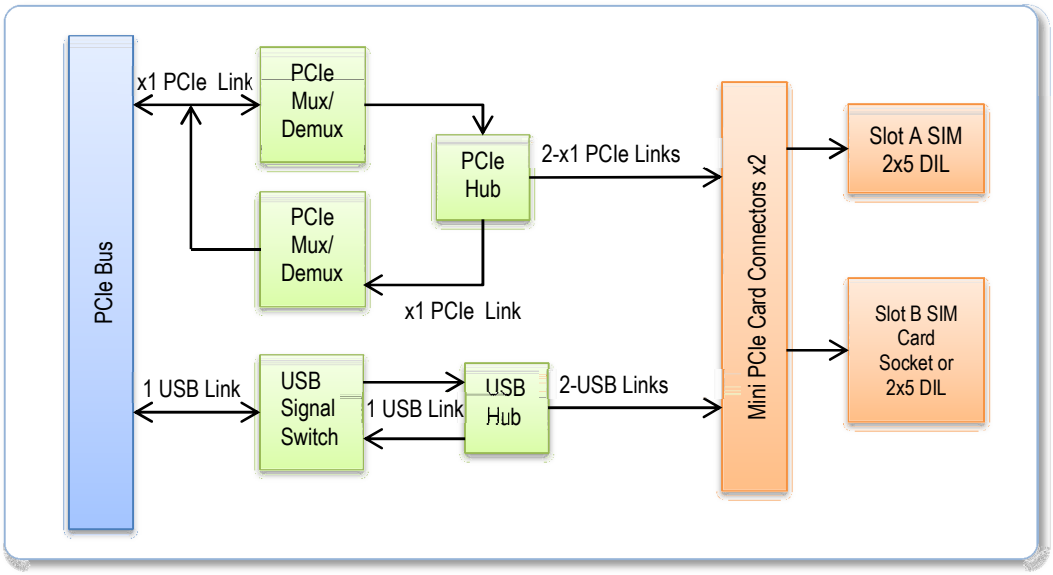

Figure 5: WLAN25202 Block Diagram

5.2 Mini PCI Express Connector

The main function of the WLAN25202 is to allow PCI/104 Express to incorporate the versatility Mini PCI Express Cards into the system. This board has two connectors that can use both the full and half size Mini PCI Express cards. As a default, only the full card mounting holes will be populated when the board is ordered unless specified in order. Mounting pegs for the half card will be shipped with each board for the user to install. This is due to a potential short due to the half card mounting pegs contacting components on the bottom side of the full size cards.

5.2.1 SIM Card Socket and Connector

Each Mini PCI Express connector has an external connector that brings out the SIM card signals. These signals are either brought out to a 0.1" connector, or to a SIM card socket. Slot A uses only a 2x5 0.1" DIL connector while Slot B has the option of either having the 2x5 DIL or the SIM card socket populated. SIM card socket is populated for Slot B as default.

5.3 Single Lane USB and PCI Express Repopulation

The WLAN25202 Mini PCI Express modules can use either a USB link or an x1 PCI Express link to operate. To ensure complete versatility, each slot has been supplied a single x1 PCI-Express and USB lane. Since each WLAN25202 board takes two x1 PCI-Express lanes and 2 USB lanes, it can hinder the stack it is in since it takes all the free USB lanes and two of the four x1 lanes. To relieve some of the stress on the system, the WLAN25202 has an onboard PCI-Express signal hub and a USB signal hub. These signal hubs take a single lane and replicate them to be used onboard, and also sends one lane back to the connector to repopulate the used lane. This allows each slot to use either a PCI-Express or USB module while not consuming either one of the links on the bus. The repopulated lanes do suffer some signal degradation; however it is minimal enough that the lanes are able to function normally.

6 Troubleshooting

If you are having problems with your system, please try the following initial steps:

- **Simplify the System** – Remove modules one at a time from your system to see if there is a specific module that is causing a problem. Perform you troubleshooting with the least number of modules in the system possible.

- **Swap Components** – Try replacing parts in the system one at a time with similar parts to determine if a part is faulty or if a type of part is configured incorrectly.

If problems persist, or you have questions about configuring this product, contact RTD Embedded Technologies via the following methods:

Phone: +1-814-234-8087
E-Mail: techsupport@rtd.com

Be sure to check the RTD web site (http://www.rtd.com) frequently for product updates, including newer versions of the board manual and application software.

7 Additional Information

7.1 PC/104 Specifications

A copy of the latest PC/104 specifications can be found on the webpage for the PC/104 Embedded Consortium:

www.pc104.org

7.2 PCI and PCI Express Specification

A copy of the latest PCI and PCI Express specifications can be found on the webpage for the PCI Special Interest Group:

www.pcisig.com

8 Limited Warranty

RTD Embedded Technologies, Inc. warrants the hardware and software products it manufactures and produces to be free from defects in materials and workmanship for one year following the date of shipment from RTD Embedded Technologies, Inc. This warranty is limited to the original purchaser of product and is not transferable.

During the one year warranty period, RTD Embedded Technologies will repair or replace, at its option, any defective products or parts at no additional charge, provided that the product is returned, shipping prepaid, to RTD Embedded Technologies. All replaced parts and products become the property of RTD Embedded Technologies. Before returning any product for repair, customers are required to contact the factory for a Return Material Authorization (RMA) number.

This limited warranty does not extend to any products which have been damaged as a result of accident, misuse, abuse (such as: use of incorrect input voltages, improper or insufficient ventilation, failure to follow the operating instructions that are provided by RTD Embedded Technologies, “acts of God” or other contingencies beyond the control of RTD Embedded Technologies), or as a result of service or modification by anyone other than RTD Embedded Technologies. Except as expressly set forth above, no other warranties are expressed or implied, including, but not limited to, any implied warranties of merchantability and fitness for a particular purpose, and RTD Embedded Technologies expressly disclaims all warranties not stated herein. All implied warranties, including implied warranties for merchantability and fitness for a particular purpose, are limited to the duration of this warranty. In the event the product is not free from defects as warranted above, the purchaser's sole remedy shall be repair or replacement as provided above. Under no circumstances will RTD Embedded Technologies be liable to the purchaser or any user for any damages, including any incidental or consequential damages, expenses, lost profits, lost savings, or other damages arising out of the use or inability to use the product.

Some states do not allow the exclusion or limitation of incidental or consequential damages for consumer products, and some states do not allow limitations on how long an implied warranty lasts, so the above limitations or exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

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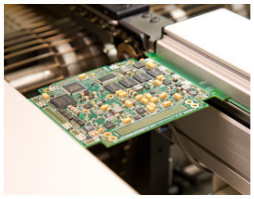
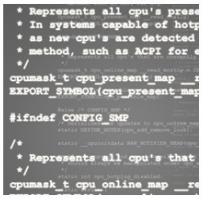

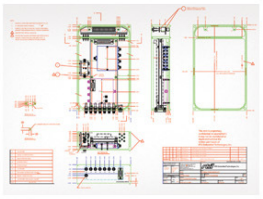
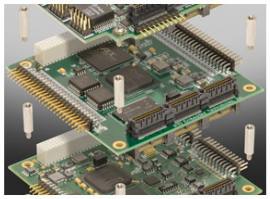

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